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Remarks

Claims 15 and 18 have been cancelled and the dependency of claims 16 and 17 has been changed to claim 8. Independent claims 1, 8 and 19 have been amended to further clarify their meaning and dependent claim 4 has been amended to conform it to amended claim 1. In view of these amendments and the following remarks, entry of this amendment and allowance of the application is requested.

Applicants' attorney appreciates the Examiner's suggested changes in claims 1, 8 and 19 during a telephone interview on December 29, 2003. These changes are believed to make them easier to read and understand. For example, it is clearer to recite a "phase difference MR image" being calculated "between" the first and second complex MR images rather than "from" the first and second complex MR images. The Examiner also believed it was easier to read the claims if the specific step from which an image or information is derived is recited. For example, in step g) of claim 1 it is now expressly stated that the "location of the implant" is "from step f)" and the "magnitude MR image" is "from step d)". Applicants do not believe these amendments change the meaning or the scope of the claims, but merely make them easier to understand.

Claim 15 has been cancelled in view of the newly cited Frankel reference. Applicants respectfully traverse the rejection of the remaining claims in this application under Section 103 in view of Frankel combined with the previously cited Bernstein '481 patent.

The Frankel reference does not disclose what the Examiner asserts. It discloses three different pulse sequences ("Sequence 1", "Sequence 2", and "Sequence 3") which can be used to acquire an image of the breast. Frankel teaches the acquisition of a single k-space data set and the reconstruction of a single magnitude image and a single phase image (not a phase difference image) from this k-space data set. Regardless of which one of three sequences is chosen, only one pulse sequence is used and only one k-space data set is acquired with the selected pulse sequence. Differentiation between tissue types is achieved in the

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reconstructed magnitude image by judicious selection of scan parameters such as TR, TE and flip angle. In addition, differentiation between tissues and a silicon implant can be seen in a phase image reconstructed from the same data. That is, the same I and Q values in the reconstructed complex image data set can be used to produce a magnitude image:

$$I_{magnitude} = \sqrt{I^2 + Q^2}$$

and a phase image:

$$I_{phase} = \tan^{-1}(I/Q)$$

This reference does not teach acquiring two k-space data sets using two different pulse sequences, and it does not disclose producing a phase difference image between two acquired k-space data sets of any kind.

This reference does teach a method for producing an MR image in which a silicon implant in a breast can be differentiated. Applicant's invention also produces an MR image in which implanted devices can be differentiated from surrounding tissues. But the two methods are different. With applicant's method an additional k-space data set must be acquired using a pulse sequence that differs from that used to acquire the first k-space data set. In addition, a phase difference image is produced from these two data sets, not just a phase image of one of them.

The Bernstein '418 patent teaches a method for producing an angiogram using an MRI system. This field is referred to as MR angiography or MRA. The object of MRA is to visualize the vasculature of the subject and null from the image all other structures. MRA does this by acquiring two data sets and effectively subtracting the two resulting images to null out static structures. Such nulled static structures include tissues (other than moving blood) and stationary implants. In other words, one would not see a stationary implant in the MRA image produced according to Bernstein '418. This is totally incompatible with the objectives set forth in the Frankel

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reference and this fact is clear "objective evidence" that it would not be obvious to one skilled in this art to combine Bernstein '418 with the Frankel reference.

The MRA method in Bernstein '418 is a variant of the so-called phase contrast (PCMRA) method. This is an alternative to the contrast enhanced method (CEMRA). In Bernstein the two image data sets are acquired with the exact same pulse sequence except a velocity encoding gradient is used in both sequences (See Figs. 3B and 3C) and this velocity encoding gradient is flipped in polarity in one of them. The two pulse sequences must be the same because you want the stationary tissues and structures to appear the same in both images so they null out when the difference is calculated (complex difference in this variation of the PCMRA method). Bernstein does not disclose the use of a pulse sequence "suitable for imaging stationary spins" as specifically required by claim 1, and it does not disclose or suggest acquiring two k-space data sets with a spin-echo pulse sequence and a gradient-recalled echo pulse sequence as specifically required in independent claims 8 and 19.

Bernstein '418 is not pertinent to the present invention. Its teachings are totally incompatible with the objective of the present invention. That is, Bernstein teaches the reconstruction of an image in which stationary tissues and stationary implants are nulled out of the image so that only the blood carrying vasculature is seen. Only with the hindsight afforded the examiner by the teaching of the present invention would she think to select steps out of this reference. Such hindsight reconstruction is improper under the law.

A reconsideration and allowance of the pending claims is requested. Applicant's attorney would appreciate a call from the examiner if possible before the January 8, 2004 due date for appeal.

The Commissioner is authorized to charge any fees under 37 CFR § 1.17 that may be due on this application to Deposit Account 17-0055. The Commissioner is also authorized to treat this amendment and any future reply in this matter requiring

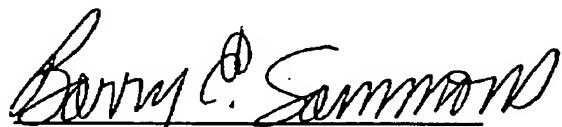
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a petition for an extension of time as incorporating a petition for extension of time for the appropriate length of time as provided by 37 CFR § 136(a)(3).

Respectfully submitted,
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